

WHAT IS CLAIMED IS:

1. A rotary type hinge device for a portable wireless terminal, which is installed between a terminal body and a folder of the portable wireless terminal, the hinge device comprising:

5 a first rotation axis for opening and closing the folder with respect to the terminal body and a second rotation axis extending perpendicular to the first rotation axis and adapted to rotate relative to the first rotation axis, the hinge device being adapted to rotate the folder about the second rotation axis in a state wherein the folder and terminal body are opened;

10 a first hinge housing coupled to the terminal body to rotate about the first rotation axis, the first hinge housing being formed with a fixing portion at its inner peripheral surface, and an opening adapted to expose the fixing portion in a direction of the second rotation axis;

15 a main shaft provided at one end with a fixing end having a shape corresponding to that of the fixing portion, the main shaft extending in the direction of the second rotation axis and being adapted to protrude outwardly through the opening of the first hinge housing at the other end thereof; and

20 a second hinge housing rotatably coupled to the other end of the main shaft protruding outwardly from the first hinge housing and adapted to rotate about the second rotation axis, the second hinge housing being fixed to the folder.

2. The rotary type hinge device as set forth in claim 1, wherein the main shaft is adapted to penetrate from a lower end surface of the second hinge housing to an upper end surface thereof, thereby causing the one end to be protruded from the upper end surface of the second hinge housing, the protruding end of the main shaft being
25 fastened with an E-ring.

3. The rotary type hinge device as set forth in claim 2, further comprising:

 a shaft cam provided at the main shaft positioned within the second hinge housing, the shaft cam being formed at its outer peripheral surface with at least one pair of stopper recesses arranged on opposite sides of the shaft cam, respectively; and

30 stopper cams formed at their respective first ends with stopper projections

having a shape corresponding to the stopper recesses, respectively, the stopper cams being adapted to stop a rotation of the second hinge housing by receiving an elastic force within the second hinge housing at a position that the stopper recesses and stopper projections come into close contact with each other, respectively, the stopper
 5 cams linearly reciprocating within the second hinge housing in accordance with the rotation of the second hinge housing.

4. The rotary type hinge device as set forth in claim 3, wherein the respective stopper recesses of the shaft cam extend in a direction perpendicular to the second rotation axis.

10 5. The rotary type hinge device as set forth in claim 3, wherein the respective stopper recesses of the shaft cam extend in a direction parallel to the second rotation axis.

6. The rotary type hinge device as set forth in claim 3, wherein a pair of stopper cams are arranged to face the shaft cam, respectively, at diametrically opposite
 15 sides of the shaft cam.

7. The rotary type hinge device as set forth in claim 3, wherein the second hinge housing is formed with a sliding guide extending longitudinally at its inner peripheral surface, and each stopper cam is formed at its outer peripheral surface with a guide protrusion corresponding to the sliding guide, whereby the sliding guide and
 20 guide protrusion are adapted to guide linear reciprocating movements of the stopper cam.

8. The rotary type hinge device as set forth in claim 2, further comprising:
 a shaft cam provided at the main shaft positioned within the second hinge housing, the shaft cam being formed at its outer peripheral surface with at least one
 25 pair of flat stopper surfaces arranged on opposite sides of the shaft cam, respectively; and

stopper cams formed at their respective first ends with stoppers, having a flat surface shape, being adapted to face the flat stopper surfaces, respectively, the stopper

cams being adapted to stop a rotation of the second hinge housing by receiving a elastic force within the second hinge housing at a position that the flat stopper surfaces and stoppers come into close contact with each other, the stopper cams linearly reciprocating within the second hinge housing in accordance with the rotation
5 of the second hinge housing.

9. The rotary type hinge device as set forth in claim 8, wherein a pair of stopper cams are arranged to face the shaft cam at diametrically opposite sides of the shaft cam.

10. The rotary type hinge device as set forth in claim 8, wherein the second
10 hinge housing is formed with a sliding guide extending longitudinally at its inner peripheral surface, and each stopper cam is formed at its outer peripheral surface with a guide protrusion corresponding to the sliding guide, whereby the sliding guide and guide protrusion are adapted to guide linear reciprocating movements of the stopper cam.

15 11. The rotary type hinge device as set forth in claim 2, wherein the second hinge housing further comprises fastening arms extended outwardly from both sides thereof, the fastening arms being formed with fastening holes at their opposite ends, respectively.

20 12. The rotary type hinge device as set forth in claim 1, wherein a flexible printed circuit protrudes from an interior space of the folder and extends longitudinally at one side of the main shaft, thereby entering into the first hinge housing through the opening thereof, and the flexible printed circuit is wound at least half way around the main shaft within the first hinge housing and then drawn from one side end of the first hinge housing.

25 13. The rotary type hinge device as set forth in claim 1, wherein the second hinge housing is fixed within one end region of the folder.

14. The rotary type hinge device as set forth in claim 1, further comprising a

folder opening/closing hinge module received within one side of the first hinge housing, the hinge module providing a rotating force to cause the folder to be opened if the folder is opened away from the terminal body exceeding a predetermined angle, and to cause the folder to be closed if the folder is away from the terminal body below
 5 the predetermined angle.

15. A rotary type hinge device for a portable wireless terminal comprising:

a first hinge housing, which is rotatable about a first rotation axis longitudinally extending through both ends thereof, the first hinge housing being formed at its inner peripheral surface with a fixing surface, and at its outer peripheral
 10 surface with an opening adapted to expose the fixing surface perpendicular to the first rotation axis;

a main shaft provided at one end with a fixing end having a shape corresponding to that of the fixing surface, the main shaft extending from the fixing end in a direction perpendicular to the first rotation axis, and being adapted to
 15 protrude outwardly through the opening of the first hinge housing at the other end thereof, thereby providing a second rotation axis; and

a second hinge housing rotatably coupled to the other end of the main shaft and adapted to rotate about the second rotation axis.

16. The rotary type hinge device as set forth in claim 15, further comprising:

20 a perforated hole formed at a lower end surface of the second hinge housing;

a shaft cam provided at the other end of the main shaft and adapted to be inserted through the perforated hole, thereby being positioned within the second hinge housing, the shaft cam being formed at its outer peripheral surface with at least one pair of stopper recesses arranged on opposite sides of the shaft cam, respectively; and

25 stopper cams formed at their respective one ends with stopper projections having a shape corresponding to the stopper recesses, respectively, the stopper cams being adapted to stop a rotation of the second hinge housing by receiving an elastic force within the second hinge housing at a position that the stopper recesses and stopper projections come into close contact with each other, respectively, the stopper
 30 cams linearly reciprocating within the second hinge housing in accordance with the rotation of the second hinge housing.

17. The rotary type hinge device as set forth in claim 16, wherein the respective stopper recesses of the shaft cam extend in a direction perpendicular to the second rotation axis.

18. The rotary type hinge device as set forth in claim 16, wherein the
5 respective stopper recesses of the shaft cam extend in a direction parallel to the second rotation axis.

19. The rotary type hinge device as set forth in claim 16, wherein a pair of stopper cams are arranged to face the shaft cam at diametrically opposite sides of the shaft cam.

10 20. The rotary type hinge device as set forth in claim 15, further comprising:
a perforated hole formed at a lower end surface of the second hinge housing;
a shaft cam provided at the other end of the main shaft and adapted to be
inserted through the perforated hole, thereby being positioned within the second hinge
housing, the shaft cam being formed at its outer peripheral surface with at least one
15 pair of flat stopper surfaces arranged on opposite sides of the shaft cam, respectively;
and

stopper cams formed at their respective one ends with stoppers having a flat
surface shape, being adapted to face the flat stopper surfaces, respectively, the stopper
cams being adapted to stop a rotation of the second hinge housing by receiving an
20 elastic force within the second hinge housing at a position that the flat stopper
surfaces and stoppers come into close contact with each other, the stopper cams
linearly reciprocating within the second hinge housing in accordance with the rotation
of the second hinge housing.

21. A rotary type hinge device for a portable wireless terminal, which is
25 installed between a terminal body and a folder of the portable wireless terminal, the
hinge device comprising:

a first rotation axis for opening and closing the folder with respect to the
terminal body and a second rotation axis extending perpendicular to the first rotation

axis and adapted to rotate relative to the first rotation axis, the hinge device being adapted to rotate the folder about the second rotation axis in a state wherein the folder and terminal body are opened;

5 a first hinge housing coupled to the terminal body to rotate about the first rotation axis, the first hinge housing being formed with a fixing groove surrounded by ribs extended to a certain height at its inner peripheral surface, and an opening adapted to expose the fixing groove in a direction of the second rotation axis;

10 a main shaft provided at one end with a fixing end having a shape corresponding to that of the fixing groove, the main shaft extending in the direction of the second rotation axis and adapted to protrude outwardly through the opening of the first hinge housing at the other end thereof; and

a second hinge housing rotatably coupled to the other end of the main shaft protruding outwardly from the first hinge housing and adapted to rotate about the second rotation axis, the second hinge housing being fixed to the folder.

15 22. The rotary type hinge device as set forth in claim 21, wherein the first hinge housing is further formed with a first guide rail extending in the direction of the second rotation axis at one side of the fixing groove, and a guide groove formed along the direction of the second rotation axis at one surface of the guide rail facing the fixing groove; and

20 the main shaft is further formed at its one side with a second guide rail extended in the direction of the second rotation axis and adapted to be inserted into the guide groove.

23. The rotary type hinge device as set forth in claim 22, wherein the first guide rail defines a slit, having a certain width, between its one side and an inner side wall of the first hinge housing.

24. The rotary type hinge device as set forth in claim 21, wherein each rib surrounding the fixing groove is formed with a first fixing hole penetrating in a direction of the first rotation axis, and

30 the fixing end of the main shaft is formed with a second fixing hole penetrating in the direction of the first rotation axis, thereby confronting with the first

fixing hole;

further comprising a fixing pin fastened through the first and second fixing holes in the direction of the first rotation axis after the fixing end is coupled to the fixing groove, thereby fixing the fixing end.

5 25. The rotary type hinge device as set forth in claim 21,
further comprising:

a shaft cam formed at its outer peripheral surface positioned within the second hinge housing with at least two pairs of stopper surfaces arranged on opposite sides of the shaft cam, respectively; and

10 stopper cams formed at their respective one ends with stopper recesses having a shape corresponding to corners formed by adjacent stopper surfaces, respectively, the stopper cams being adapted to stop a rotation of the second hinge housing by receiving a certain elastic force within the second hinge housing at a position that the corners of the shaft cam and the stopper recesses come into close contact with each
15 other, respectively, the stopper cams linearly reciprocating within the second hinge housing in accordance with the rotation of the second hinge housing, wherein the main shaft penetrates the second hinge housing.

26. The rotary type hinge device as set forth in claim 25,

20 further comprising a plate spring received within the second hinge housing, the plate spring being configured so that its both ends are bent and extended to face each other, thereby providing an elastic force to cause the stopper cams to come into close contact with the shaft cam, wherein the stopper cams are provided at both sides of the shaft cam, respectively.

27. The rotary type hinge device as set forth in claim 25,

25 further comprising coil springs received within the second hinge housing, the coil springs being adapted to provide an elastic force to the stopper cams, thereby causing the stopper cams to come into close contact with the shaft cam, wherein the stopper cams are provided at both sides of the shaft cam, respectively.

28. The rotary type hinge device as set forth in claim 21,

further comprising:

a shaft cam formed at an outer peripheral surface of the main shaft positioned within the second hinge housing with at least one pair of first stopper surfaces arranged on opposite sides of the shaft cam, respectively; and

- 5 stopper cams formed at their respective one ends with second stopper surfaces facing the first stopper surfaces, respectively, the stopper cams being adapted to stop a rotation of the second hinge housing by receiving an elastic force within the second hinge housing at a position that the first and second stopper surfaces come into close contact with each other, respectively, the stopper cams linearly reciprocating within
10 the second hinge housing in accordance with the rotation of the second hinge housing, wherein the main shaft penetrates the second hinge housing.

29. The rotary type hinge device as set forth in claim 28, further comprising a plate spring received within the second hinge housing, the plate spring being configured so that its both ends are bent and extended to face each other, thereby
15 providing an elastic force to cause the stopper cams to come into close contact with the shaft cam, wherein the stopper cams are provided at both sides of the shaft cam, respectively.

30. The rotary type hinge device as set forth in claim 28,
further comprising coil springs received within the second hinge housing, the
20 coil springs being adapted to provide an elastic force to the stopper cams, thereby causing the stopper cams to come into close contact with the shaft cam, wherein the stopper cams are provided at both sides of the shaft cam, respectively.